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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Response to Arguments

Regarding claim 1, Applicant's argument is Otsuki discloses of N types of dots for a pixel area merely relates to the selection of only one of the N types of dots for a single pixel's area. Thus, the cited pixel area is merely a single pixel, and only one of the different types of dots is selected for that pixel area. A single pixel is not a pixel group as claimed, nor can a single type of dot be the equivalent of multiple pixels.

In response: Otsuki discloses pixel group (e.g., a printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area on a print medium. N is an integer of at least two, column 1, lines 29-35. Note: since the printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area. Thus N type of dots include different size of dots (which N is an integer of at least two) and dots formed at different positions in pixel area having different pixels (not a single pixel) with different size of dots at different position, figures 10A-10D, dot types formable with different Mask Patterns (pixel groups)).

Shimizu differs from claim 1, in that he does not explicitly disclose pixel group which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; image output device comprising: a number data receiving module that

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receives the dot number data of the pixel group with respect to each type of dot; a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation; a pixel position determination module that determines positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order; and a dot formation module that creates the multiple different types of dots at the determined positions of the dot-on pixels.

Otsuki discloses pixel group (e.g., a printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area on a print medium. N is an integer of at least two, column 1, lines 29-35. Note: since the printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area. Thus N type of dots include different size of dots (which N is an interger of at least two) and dots formed at different positions in pixel area having different pixels with different size of dots at different position), which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions (e.g., the drive signal generator is configured to generate drive signals for driving the ejection drive elements to form one of the N types of dots (since N is equal or greater than 2. Thus dots have different size) in each pixel area in response to print signals, column 1, lines 39-42. Note: since the drive signal generator is configured to generated drive signals to form of the N types of dots in each pixel area (pixel area = two dimensional

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size with primary and secondary direction). Thus each pixel area includes multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; e.g., the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern selection data MPS and dot type selection data DTS for each single pixel, Column 4, lines 45-48. Note: since the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern (mask pattern = having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions)); image output device (e.g., figure 2) comprising: a number data receiving module (e.g., buffer 42A, 42B, column 3, lines 6-12) that receives the dot number data of the pixel group with respect to each type of dot (e.g., control unit 45 processes to develop dot data representing dot recording status for each pixel referencing font data and graphics functions in ROM 43, column 3, lines 9-12); a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation (e.g., the hardware/software that perform the function disclosed in column 5, lines 50-60); a pixel position determination module (e.g., the hardware/software associated with the masking signal generation circuit 334 that perform the function disclosed in column 5, line 61 – column 6, line 21) that determines positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order (e.g., the hardware/software associated with the masking signal generation circuit 334 that perform the function disclosed in column 5, line 61 – column

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6, line 21); and a dot formation module (e.g., the hardware/software associated with print head (module 50, figure 1) that perform the function disclosed in column 7, lines 1-7) that creates the multiple different types of dots at the determined positions of the dot-on pixels (e.g., figures 10A-10D).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu to include pixel group which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; image output device comprising: a number data receiving module that receives the dot number data of the pixel group with respect to each type of dot; a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation; a pixel position determination module that determines positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order; and a dot formation module that creates the multiple different types of dots at the determined positions of the dot-on pixels as taught by Otsuki. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu by the teaching of Otsuki to be able to print different type of dots at different density and increase printing speed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 16, 20, 23, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (Shimizu) (US 2003/0112293) in view of Otsuki (US 6,652,067).

With regard to claim 1, Shimizu discloses an image output control system (e.g., figure 2, paragraph 0045) comprising an image processing device (e.g., a control/operation portion 13, paragraph 0045) that makes image data subjected to a preset series of image processing (e.g., different preset series of image processing disclosed in paragraph 0048), and an image output device (e.g., printer 22, figure 3) that creates multiple different types of dots having different densities per unit area according to a result of the preset series of image processing (paragraph 0068), so as to output an image, image processing device comprising: a dot number determination module (e.g., the hardware/software associated with the control/operation 13 portion that performs the function disclosed in paragraph 0071) that determines a number of dots to be created in each pixel group included in the image, with respect to each of the multiple different types of dots according to the image data (e.g., figures 9 and 10, paragraph 0068); and a number data output module that outputs (e.g., the program of the control/operation portion 13 that perform the function disclosed, paragraph 0071) the determined number of dots to be created in the pixel group with respect to each type of dot, as dot number data of the pixel group (e.g., the kind of dot for at least one color is different from the kinds of dot for other colors, paragraphs 0015, 0072, 0073), to image output device (e.g., a printing system, figure 2).

Shimizu differs from claim 1, in that he does not explicitly disclose pixel group which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; image output device comprising: a number data receiving module that receives the dot number data of the pixel group with respect to each type of dot; a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation; a pixel position determination module that determines positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order; and a dot formation module that creates the multiple different types of dots at the determined positions of the dot-on pixels.

Otsuki discloses pixel group (e.g., a printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area on a print medium. N is an integer of at least two, column 1, lines 29-35. Note: since the printing apparatus capable of selectively forming any of N types of dots which are different in at least one of an ink amount and a dot-formed position in a pixel area. Thus N type of dots include different size of dots (which N is an interger of at least two) and dots formed at different positions in pixel area having different pixels with different size of dots at different position), which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions (e.g., the drive signal generator is configured to generate drive signals for driving the ejection

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drive elements to form one of the N types of dots (since N is equal or greater than 2. Thus dots have different size) in each pixel area in response to print signals, column 1, lines 39-42. Note: since the drive signal generator is configured to generated drive signals to form of the N types of dots in each pixel area (pixel area = two dimensional size with primary and secondary direction). Thus each pixel area includes multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; e.g., the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern selection data MPS and dot type selection data DTS for each single pixel, Column 4, lines 45-48. Note: since the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern (mask pattern = having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions)); image output device (e.g., figure 2) comprising: a number data receiving module (e.g., buffer 42A, 42B, column 3, lines 6-12) that receives the dot number data of the pixel group with respect to each type of dot (e.g., control unit 45 processes to develop dot data representing dot recording status for each pixel referencing font data and graphics functions in ROM 43, column 3, lines 9-12); a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation (e.g., the hardware/software that perform the function disclosed in column 5, lines 50-60); a pixel position determination module (e.g., the hardware/software associated with the masking signal generation circuit 334 that perform the function disclosed in column 5, line 61 – column 6, line 21) that determines

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positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order (e.g., the hardware/software associated with the masking signal generation circuit 334 that perform the function disclosed in column 5, line 61 – column 6, line 21); and a dot formation module (e.g., the hardware/software associated with print head (module 50, figure 1) that perform the function disclosed in column 7, lines 1-7) that creates the multiple different types of dots at the determined positions of the dot-on pixels (e.g., figures 10A-10D).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu to include pixel group which is set to have a predetermined number of multiple pixels having a two-dimensional size comprising multiple pixels arranged in primary and secondary scan directions; image output device comprising: a number data receiving module that receives the dot number data of the pixel group with respect to each type of dot; a priority order specification module that specifies a priority order of individual pixels in the pixel group for dot creation; a pixel position determination module that determines positions of dot-on pixels in the pixel group with respect to each type of dot, based on the dot number data of the pixel group with respect to each type of dot and the specified priority order; and a dot formation module that creates the multiple different types of dots at the determined positions of the dot-on pixels as taught by Otsuki. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu by the teaching of Otsuki to be able to print different type of dots at different density and increase printing speed.

With regard to claim 2, Shimizu differs from claim 2 in that he does not disclose wherein priority order specification module selects one out of multiple options for the priority order, which are provided in advance, with respect to the pixel group.

Otsuki discloses wherein priority order specification module selects one out of multiple options for the priority order, which are provided in advance, with respect to the pixel group (e.g., figures 10A-F, column 7, lines 1-27).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu to include priority order specification module selects one out of multiple options for the priority order, which are provided in advance, with respect to the pixel group as taught by Otsuki. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu by the teaching of Otsuki to be able to print different type of dots at different density and increase printing speed.

With regard to claim 3, Shimizu differs from claim 3 in that he does not disclose wherein number data output module has a dot number combination mapping table that maps each combination of numbers of the multiple different types of dots to a preset code, number data output module refers to the dot number combination mapping table to convert a combination of the numbers of the respective types of dots determined with respect to the pixel group to a corresponding preset code and outputs the preset code, in place of the dot number data of the pixel group, to image output device, and number data receiving module comprises: a code mapping table that maps each preset code to a combination of the numbers of the multiple different types of dots; and a number data

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conversion module that receives the output preset code of the pixel group, and refers to the code mapping table to reconvert the received preset code to dot number data of the pixel group with respect to each type of dot.

Otsuki discloses wherein number data output module has a dot number combination mapping table (e.g., figure 10E) that maps each combination of numbers of the multiple different types of dots (e.g., figures 10A-10D) to a preset code (e.g., MPS code in figure 10E, column 7, lines 1-16), number data output module refers to the dot number combination mapping table (e.g., figure 10E) to convert a combination of the numbers of the respective types of dots (e.g., dot types selection data (A-1)-(A-4), ...(D-1)-(D-4), figure 10F, column 7, lines 17-27) determined with respect to the pixel group (e.g., dot type selection data 00, 01, 10, 11 figure 10F, column 7, lines 17-27) to a corresponding preset code (e.g., MPS code in figure 10E, column 7, lines 1-16) and outputs the preset code (e.g., MPS code, figures 7A-7B), in place of the dot number data of the pixel group (e.g., Cell (T21, T22...), figure 10F), to image output device (column 7, lines 36-38), and number data receiving module (e.g., the ejection drive elements PZT, column 5, lines 50-52) comprises: a code mapping table (e.g., figures 10E and 10F) that maps each preset code to a combination of the numbers of the multiple different types of dots; and a number data conversion module (e.g., the hardware/software that perform the function disclosed in column 7, lines 17-27) that receives the output preset code of the pixel group, and refers to the code mapping table to reconvert the received preset code to dot number data of the pixel group with respect to each type of dot (e.g., figure 10F).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu to include wherein number data output module has a dot number combination mapping table that maps each combination of numbers of the multiple different types of dots to a preset code, number data output module refers to the dot number combination mapping table to convert a combination of the numbers of the respective types of dots determined with respect to the pixel group to a corresponding preset code and outputs the preset code, in place of the dot number data of the pixel group, to image output device, and number data receiving module comprises: a code mapping table that maps each preset code to a combination of the numbers of the multiple different types of dots; and a number data conversion module that receives the output preset code of the pixel group, and refers to the code mapping table to reconvert the received preset code to dot number data of the pixel group with respect to each type of dot as taught by Otsuki. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu by the teaching of Otsuki to be able to print different type of dots at different density and increase printing speed.

Referring to claim 16:

Claim 16 is the method claim corresponding to operation of the device in claim 1 with method steps corresponding directly to the function of device elements in claim 1. Therefore claim 16 is rejected as set forth above for claim 1.

Referring to claim 20:

Claim 20 is the computer program product storing computer instructions claim corresponding to operation of the device in claim 1 with instruction steps corresponding directly to the function of device elements in claim 1. Therefore claim 20 is rejected as set forth above for claim 1.

With regard to claim 23, the subject matter is similar to claim 1. Therefore claim 23 is rejected as set forth above for claim 1.

Regarding claim 26, Otsuki discloses wherein the pixel group includes 4 x 2 pixels (e.g., the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern selection data MPS and dot type selection data DTS for each single pixel, Column 4, lines 45-48. Note: since the print signal PRT is converted to dot data for each 4 consecutive pixels in the main scan direction to generate combinations of mask pattern (mask pattern = array of halftone screen). Thus an array of halftone screen can be any size including 4x2 pixels).

Regarding claim 27, Shimizu differs from claim 27 in that he does not explicitly disclose defined for each pixel group among previously prepared multiple correspondence relations to determine the number of dots, and correspondence relation is obtained from the arrangement of multiple threshold values, which corresponds to the number of pixels included in the pixel group and is taken out from a global dither matrix.

Otsuki discloses defined for each pixel group among previously prepared multiple correspondence relations to determine the number of dots, and correspondence relation is obtained from the arrangement of multiple threshold values, which corresponds to the

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number of pixels included in the pixel group and is taken out from a global dither matrix (column 4, lines 44-55).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu to include defined for each pixel group among previously prepared multiple correspondence relations to determine the number of dots, and correspondence relation is obtained from the arrangement of multiple threshold values, which corresponds to the number of pixels included in the pixel group and is taken out from a global dither matrix as taught by Otsuki. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu by the teaching of Otsuki to be able to print different type of dots at different density and increase printing speed.

Regarding claim 28, Otsuki discloses wherein the pixel group has $M \times N$ pixels, with M and N being integers greater than one (e.g., dot types formable with different Mask Patterns, figures 10A-10D).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (Shimizu) (US 2003/0112293) and Otsuki (6,652,067) as applied to claim 1 above, and further in view of Shimada et al. (Shimada) (US 6,293,643).

With regard to claim 4, Shimizu and Otsuki combined, differ from claim 4 in that they do not explicitly disclose wherein pixel position determination module sequentially determines the positions of the dot-on pixels with respect to each type of dot in a descending order of the density per unit area of the multiple different types of dots.

Shimada discloses wherein pixel position determination module sequentially determines the positions of the dot-on pixels with respect to each type of dot in a descending order of the density per unit area of the multiple different types of dots (e.g., steps S350-S500, figure 12).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu and Otsuki combined, to include wherein pixel position determination module sequentially determines the positions of the dot-on pixels with respect to each type of dot in a descending order of the density per unit area of the multiple different types of dots as taught by Shimada. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Shimizu and Otsuki combined by the teaching of Shimada to have better image quality.

Allowable Subject Matter

Claims 5-8, and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 5, the image output control system in according with claim 1, a first dot number determination module that compares the first dot density data with the threshold values included in the threshold value group and sets a number of threshold values that are smaller than the first dot density data to a number of the first dots to be created in the pixel group; and a second dot number determination module that compares the second dot density data with the threshold values included in the threshold value group and sets a number of the second dots to be created in the pixel group, based on the preset number of the first dots and a number of threshold values that are smaller than the second dot density data, second dot number determination module comparing the second dot density data with only threshold values that are greater than the first dot density data and counting the number of the threshold values that are smaller than the second dot density data, so as to set the number of the second dots to be created in the pixel group. Shimada et al. (US 6,293,643), teaches a similar method for recording image data, either singularly or in combination with cited references, fail to anticipate or render the above underline limitations obvious (to use in combination with other claimed limitations).

Claims 6-8 are object because it depends on claim 5.

Claim 17 is similar subject matter as claim 5.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quang N. Vo whose telephone number is (571)270-1121. The examiner can normally be reached on 7:30AM-5:00PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571)272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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